



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,280	08/13/2001	David J. Edlund	NPW 318	8195

23581 7590 04/13/2004

KOLISCH HARTWELL, P.C.  
520 S.W. YAMHILL STREET  
SUITE 200  
PORTLAND, OR 97204

EXAMINER
----------

CREPEAU, JONATHAN

ART UNIT	PAPER NUMBER
----------	--------------

1746

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/929,280	<b>Applicant(s)</b> EDLUND ET AL.	
	<b>Examiner</b> Jonathan S. Crepeau	<b>Art Unit</b> 1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2001.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-53 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/13, 7/18, 9/3, 7/28</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 22-26, 28, 33-35, 37, 38, 47, and 49-51 are rejected under 35 U.S.C. 102(e) as being anticipated by Lomax et al (U.S. Patent 6,368,735). Regarding claims 22 and 23, the reference teaches a fuel processor (12), a hydrogen storage device (16), a fuel cell stack (14), and a controller (40) adapted to regulate the delivery of hydrogen to the storage device and the flow of hydrogen therefrom (see abstract). Regarding claims 24-26, 28, and 30, the controller is adapted to monitor parameters such as the applied load and the hydrogen pressure (see col. 5, line 55 et seq.). Regarding claims 33-35, the controller includes a sensor assembly (42, 44, 46) which communicates with the controller via wired linkages (see Fig. 1). Regarding claims 37 and 38, the controller is a computerized CPU (see col. 5, line 55). Regarding claim 47, an electrochemical compressor (separation membrane 22) is present between the fuel processor and the storage device (see Fig. 1). Regarding claims 49-51, the storage device includes a hydride bed which has a heating assembly adapted to be controlled by the controller (see Fig. 1).

Thus, the instant claims are anticipated.

3. Claims 1-8, 10-14, 71, 21, 22, 24, 25, 31-35, 37-39, 45, 48, and 49 are rejected under 35 U.S.C. 102(e) as being anticipated by Ogino (U.S. Patent 6,294,276). Regarding claims 1, 22, and 45, the reference teaches a fuel processor (30), a hydrogen storage device (55), a mechanical compressor (50) between the processor and the storage device, and a fuel cell stack (see Fig. 1). Regarding claims 2 and 3, the compressed stream and the pre-compressed stream have the same composition. Regarding claims 4, 10-14, 46, and 47, the system comprises an electrochemical compressor (i.e, palladium membrane 40) (see col. 11, line 50). Regarding claims 5 and 48, the storage device comprises a compressed gas tank (see col. 30, line 62). Regarding claim 7, the fuel cell powers an automobile motor. Regarding claims 6 and 8, the fuel processor, fuel cell, hydrogen storage device, and motor are integrated together in the vehicle housing. Regarding claim 17, the hydrogen is produced by reforming (see Fig. 1). Regarding claims 21-23, the system comprises a controller (60) for controlling the amount of hydrogen delivered to the storage device and the flow of hydrogen therefrom (see Fig. 1). Regarding claims 24, 25, and 31, the hydrogen is regulated in response to the applied load and the amount of hydrogen in the storage device (see col. 19, line 15; col. 12, line 52). Regarding claim 32, the controller also regulates the fuel processor via valve 16A (see Fig. 1). Regarding claims 33-35, the controller includes a sensor assembly which communicates with the controller via wired linkages (see Fig. 1). Regarding claims 37-39, the controller is a computerized CPU (62) having a memory device (64) (see Fig. 1). Regarding claim 49, the storage device may comprise a hydride bed (see col. 30, line 62).

Thus, the instant claims are anticipated.

Art Unit: 1746

4. Claims 1-3, 5, 7, 9, 10, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Merida-Donis (U.S. Pre-Grant Publication No. 2004/0013918). Regarding claim 1, the reference teaches a fuel processor (501), a hydrogen storage device (525), a mechanical compressor (523) between the processor and the storage device, and a fuel cell stack (802) (see Figs. 5 and 7; paragraph 43). Regarding claims 2 and 3, the compressed stream and the pre-compressed stream have the same composition. Regarding claim 5, the storage device comprises a plurality of compressed gas tanks (see Fig. 5). Regarding claim 7, the fuel cell powers a load (855) (see paragraph 84). Regarding claim 9, a pressure regulating device (valve 527) delivers the hydrogen to the storage device (see Fig. 5). Regarding claims 10 and 20, the hydrogen is produced via electrolysis from a water feed stream.

Thus, the instant claims are anticipated.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 36 and 39-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lomax et al. in view of Colborn (U.S. Patent 6,522,955).

Art Unit: 1746

Lomax et al. is applied to claims 22-26, 28, 33-35, 37, 38, 47, and 49-51 for the reasons stated above.

However, the reference does not expressly teach that the controller comprises a wireless communication linkage as recited in claim 36, that the controller comprises a memory (claim 39), or that the controller comprises an interface capable of having a user input (claims 40-44).

Colborn is directed to a system and method for power management. The system comprises a communication device (i.e., controller) (102). The device comprises a display (600), user input (404), memory (608) and a wireless linkage (see col. 8, lines 37-49; col. 10, line 7 et seq.).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the control device of Colborn in the system of Lomax et al. In column 4, line 10, Colborn teaches that it is an object of the invention is "to provide a power management system that is compact, efficient, and easy to use." As such, the artisan would be motivated to use the control device of Colborn in the system of Lomax et al.

7. Claims 52 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lomax et al. in view of Skoczylas et al (U.S. Patent 6,666,961).

Lomax et al. is applied to claims 22-26, 28, 33-35, 37, 38, 47, and 49-51 for the reasons stated above.

However, the reference does not expressly teach that the hydrogen storage device comprises a carbon nanotube bed, as recited in claims 52 and 53.

Skoczylas et al. is directed to an electrochemical cell. In column 8, line 52, the reference teaches that “[t]he hydrogen produced hereby can be stored as high-pressure gas, or alternatively, in a solid form, such as a metal hydride, a carbon based storage (e.g. particulates, nanofibers, nanotubes, or the like).”

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Skoczylas et al. indicates that metal hydrides and carbon nanotubes are functionally equivalent for storing hydrogen. As such, it would be obvious to substitute the carbon nanotubes of Skoczylas et al. for the metal hydride of Lomax et al. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

8. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merida-Donis in view of Wojtowicz et al (U.S. Pre-Grant Publication No. 2002/0041986).

Merida-Donis is applied to claims 1-3, 5, 7, 9, 10, and 20 for the reasons stated above. However, the reference does not expressly teach that the hydrogen is produced via reforming (claim 17), pyrolysis (claim 18), or partial oxidation (claim 19).

Wojtowicz et al is directed to a method of producing hydrogen comprising the steps of pyrolysis and steam reforming (see Fig. 1). The reference also discloses a partial oxidation method of producing hydrogen (see paragraph 7).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use either the pyrolysis/steam reforming method or the partial oxidation method of producing hydrogen in the system of Merida-Donis. Regarding the pyrolysis/reforming method, Wojtowicz et al teaches the following in paragraph 20:

[0020] It is also an object of the invention to provide a power system wherein hydrogen gas for use in a fuel cell is produced from a hydrocarbonaceous material, and wherein the system may be self-contained and implemented in a transport vehicle.

Therefore, the artisan would be motivated to use the pyrolysis/steam reforming method of producing hydrogen in the system of Merida-Donis. Further, regarding the partial oxidation method, Wojtowicz et al teaches the following in paragraph 7:

1999). The advantages of partial oxidation include simplicity, exothermicity of the process, sulfur tolerance, rapid start-up, rapid response to load changes, and compactness.

As such, the artisan would also be motivated to use the partial oxidation method of producing hydrogen in the system of Merida-Donis.



Art Unit: 1746

9. Claims 4, 11-14, 21, 22, 45, 46, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merida-Donis in view of Lomax et al.

Merida-Donis is applied to claims 1-3, 5, 7, 9, 10, and 20 for the reasons stated above. However, the reference does not expressly teach that system comprises a palladium membrane for separating hydrogen (e.g., an "electrochemical compressor"), as recited in claims 4, 11-14, 45, and 46, or that the system comprises a controller for controlling the hydrogen storage system (claims 21 and 22).

As set forth above, Lomax et al. is directed to a fuel cell system comprising a reformer (12), a palladium hydrogen separation membrane (22), and a controller (40) for controlling a hydrogen storage system (16).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the reformer, palladium membrane, and controller of Lomax et al. in the system of Merida-Donis. In column 2, line 18, Lomax et al. teach the following:

Accordingly, it would be desirable to provide a fuel cell power generation system for an electric vehicle which responds essentially instantaneously to large power demands without concern over carbon monoxide and other harmful gases, and is able to start up an electric vehicle engine in less than about three seconds.

As such, the artisan would be motivated to incorporate the reformer, palladium membrane, and controller of Lomax et al. in the system of Merida-Donis.

Art Unit: 1746

10. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogino in view of Clawson et al (U.S. Pre-Grant Publication No. 2002/0004152).

Ogino is applied to claims 1-8, 10-14, 71, 21, 22, 24, 25, 31-35, 37-39, 45, 48, and 49 for the reasons stated above.

However, the reference does not expressly teach that the system comprises a pressure-swing absorption unit, as recited in claim 15, or a further hydrogen purification unit, as recited in claim 16.

Clawson et al. is directed to a fuel cell system. The reference teaches a pressure swing absorption unit and a CO removal unit in paragraphs 49 and 63.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the pressure swing absorption and CO removal units of Clawson et al. in the system of Ogino. In paragraph 49, Clawson et al. teach that “[s]uch systems deliver pure hydrogen to the fuel cell.” Accordingly, the artisan would be motivated to use the pressure swing absorption unit and the CO removal unit of Clawson et al. in the system of Ogino, in hopes of increasing the purity of the hydrogen.

11. Claims 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogino in view of Jones (U.S. Patent 6,686,078).

Ogino is applied to claims 1-8, 10-14, 71, 21, 22, 24, 25, 31-35, 37-39, 45, 48, and 49 for the reasons stated above.

Art Unit: 1746

However, Ogino does not expressly teach that the measured operating parameters include the flowrate of hydrogen from the fuel processor (claim 27) or the “operating state” of the fuel processor (claim 29).

Jones is directed to a method of operating a reformer. The method employs sensors (64, 43) for detecting fuel flow to the reformer (e.g., an “operating state” of the reformer) and the flowrate of hydrogen from the reformer, and a regulator (45) for regulating hydrogen flow to the fuel cell (see Fig. 1).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the sensors of Jones in the system of Ogino. In column 1, line 58, Jones teaches the following:

Thus, there is a need for an efficient method and fuel cell system which inhibits the flooding of fuel cells particularly in periods of low electrical demand.

As such, the artisan would be sufficiently motivated to use the sensors of Jones in the system of Ogino.

### *Conclusion*

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

Art Unit: 1746

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (571) 272-1302. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau  
Patent Examiner  
Art Unit 1746  
April 10, 2004